

The Canadian Entomologist

LXI.

ORILLIA, DECEMBER, 1929.

No. 12.

ANCISTROCERUS CAPRA AND THE LARVAE OF EPARGYREUS TITYRUS. (HYMENOP.)

BY J. W. BUCKLE,

Montreal, Que.

During the past summer I noticed that the wasp, *Ancistrocerus capra* (De Sauss) was frequently to be taken on the Locust Tree (*Robinia pseudacacia*), so one afternoon about the middle of August I thought I would try to discover what was the attraction. I did not have to wait long for a wasp and soon found one which appeared busy hunting. Many of the leaves on this particular tree had the edges folded over and swollen, the work of some gall maker; she examined these leaves very closely, but I hardly thought that what was in them would be of any use to, a wasp the size of *capra*. I soon discovered, however, what she was looking for; leaves fastened together forming the nest of the caterpillar of the Silver Spotted Skipper (*Epargyreus tityrus*), the Locust Tree being one of the principal food plants of this insect. I was fortunate in that she found one a very short distance from where I was standing, so close indeed that I could watch operations without difficulty.

This nest was formed of three leaves fastened together, and contained a larva about three parts grown. At the bottom of the nest, due to the petioles of the leaves, there was a fairly large opening. The wasp ran up and down each side of the nest several times, thrust her head between the leaves at the bottom, immediately withdrawing it, and darted to the top. This she did a few times without any result, and then left the nest and hovered about the bush for a minute or two. On returning again to the nest her efforts were more determined. She thrust her head well up between the leaves, and this time the caterpillar came just a little way out of the tip of the nest, showing a little more than its head. The wasp made a rush, but before it could reach the larva it had drawn back within the leaves again. The wasp tried once more, and this time the larva emerged a little further, but again retreated safely before the wasp could reach it. At the third attempt the wasp went so far into the nest as to almost disappear from sight, and the larva came out so far that before it could draw back, the wasp seized it with her mandibles. Her movements were very quick; she caught the caterpillar just behind the neck, pulled it out of the nest instantly, turned its abdomen under its prey, and stung it in one of the front segments, not applying its sting to the posterior ones. During the process the caterpillar struggled violently, and the wasp continued to sting it until it was quiet. There was no hurried stinging after the first one, but the sting was applied deliberately at different places. Then, still holding the caterpillar by the neck with her mandibles, she put the body beneath hers, between her two front pairs of legs, and flew off to a leaf a short distance away, where she remained for two or three minutes. Her head was turned away from me so that I could not see if she was crushing her prey as some

wasps do, but I think she was resting. She then flew off, but was back in ten minutes hunting again.

I saw the above operation a number of times afterwards, but the wasp does not always make a capture when she finds a nest, the caterpillar often escaping. Before the wasp can withdraw her head and get to the tip of the leaves, it drops to the ground. I saw this happen one night three different times, and when this took place the wasp did not follow the caterpillar to the ground, but just looked for another nest.

Sometimes the nest was formed of two leaves only, closely fastened together, the larva between being small, and in this case the operation was different. The wasp gnawed a hole in the top leaf and pulled the caterpillar out. I saw this done on three occasions only, and on one of these for some reason the wasp dropped the caterpillar after stinging it and commenced to search for another one.

At this particular part of Mount Royal locust trees are plentiful, and during the past summer contained many nests of the larvae of *Epargyreus tityrus*, and as, after my first experience, I never passed that way without seeing *capra* hunting, it must be a very serious enemy. I also took several specimens of *Ancistrocerus parietum* (Linn) hovering about these trees, although I never saw this species make a capture. It is probable that they, and perhaps others of the larger Odynerids, also use the larvae of this skipper to provision their nests, and *capra*, being by far our most plentiful species, would be most frequently noticed.

SOME APPARENTLY NEW MICROLEPIDOPTERA.*

BY J. MCDUNNOUGH,

Ottawa, Ont.

PYRAUSTINAE

Phlyctaenia nordeggensis n. sp.

Palpi, head, thorax and primaries light brownish ochreous, the latter deepest in color along the basal half of costa. Maculation very indistinct, indicated merely in a shade of color slightly deeper than that of the remainder of the wing; orbicular recumbent, oval, reniform rather small, upright; t. a. line scarcely perceptible, rounded outwardly; t. p. line fairly clear, even, parallel to outer margin to beyond cell, bending inward strongly to base of vein 2, and then perpendicular to inner margin with a slight outward angle in the fold; two pale points on each side of this line on costa and another similar one above reniform; traces of a dark submarginal band, most distinct on costa where it forms a slight apical dark blotch; faint broken smoky terminal line; fringes dirty white, cut by a darker line near base. Secondaries dirty white, tinged with smoky along outer margin; a faint smoky discal dot and subterminal curved line; terminal line and fringes as on primaries. Beneath, primaries light smoky up to t. p. line; terminal area and secondaries dull whitish, with slight dark sprinkling; maculation of upper side repeated. Expanse 20-23 mm.

Holotype.—♂, Nordegg, Alta., June 26, 1921, (J. McDunnough); No. 3099 in the Canadian National Collection, Ottawa.

Allotype.—♀, Windermere, B. C., July 11, (Wolley-Dod).

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

Paratypes.—2 ♂, Nordegg, Alta., June 19, July 14, (J. McDunnough).

The species is about the size and has the wing-shape of *inquinalis* Zell., and the genitalia are of the same type as those of *itysalis*, the species being an undoubted *Phlyctaenia* in the sense that the outer spur of the first pair of spurs on the hind tibia is extremely short. As I can find no description in the literature available for the species I venture to describe it as new.

***Phlyctaenia sheppardi* n. sp.**

Superficially quite similar to the preceding species, but paler in color with even more indistinct maculation. The wing-shape is also broader and the species is probably most closely related to *helvalis* Wlk. Primaries pale brownish, much as in *helvalis* but not quite so heavily scaled; maculation indistinct; orbicular and reniform faintly outlined in deeper brown scaling, the former oval, the latter slightly oblique; t.a. line immediately basad of the orbicular, almost perpendicular; t. p. line very faintly crenulate in costal portion, slightly bent outward below costa, then parallel to outer margin and apparently (as far as can be seen in the type specimens) with a deep sinus below the cell, extending inward to the level of the reniform and rounded at its bottom; faint terminal dark dots and pale fringes. Secondaries whitish with smoky shading along outer margins; a faint discal dot and a curved postmedian line, paralleling outer margin and obsolescent as it approaches inner margin. Beneath primaries considerably shaded with smoky; reniform and orbicular, four dashes on costa before apex, and a t. p. line, deep smoky; this latter line does not seem to follow quite the same course as on the upper side but is merely bent inward below cell and then perpendicular to inner margin, without the sinus which appears to be present on the upper side; secondaries whitish with a faint bent postmedian line, a discal dot and a similar one at the base of veins 3 and 4; terminal area and fringes on both wings as on upper side. Expanse 20-25 mm.

Holotype.—♂, Montreal, Que., July 8, (A. C. Sheppard); No. 3100 in the Canadian National Collection, Ottawa.

Paratypes.—4 ♂, Montreal, Que., July 3, 8, 9, (A. C. Sheppard); one of these in the Collection of the U. S. National Museum.

I take pleasure in naming the species after the collector, who has kindly presented the above mentioned series to the Canadian National Collection, Ottawa.

CRAMBINAE

***Loxocrambus awemensis* n. sp.**

Male.—Palpi, head, thorax and primaries pale ochreous; cubital vein, from base to end of cell, white, with slight dark shading below; all veins, except anal one, narrowly outlined in white, with white lines alternating with light brown ones in the interspaces as far as the subterminal line, giving to the costal half of wing a very striate appearance; some slight white scaling in the outer half of cell; subterminal line close to outer margin and subparallel to same, light brown, with a faint narrow silvery outer border; terminal space narrow, dusted with white scaling and with three black dots opposite the bulge in the outer margin. Fringes whitish at the base, darker in outer half. Secondaries whitish, shiny, with slight smoky shading outwardly. Expanse 22 mm.

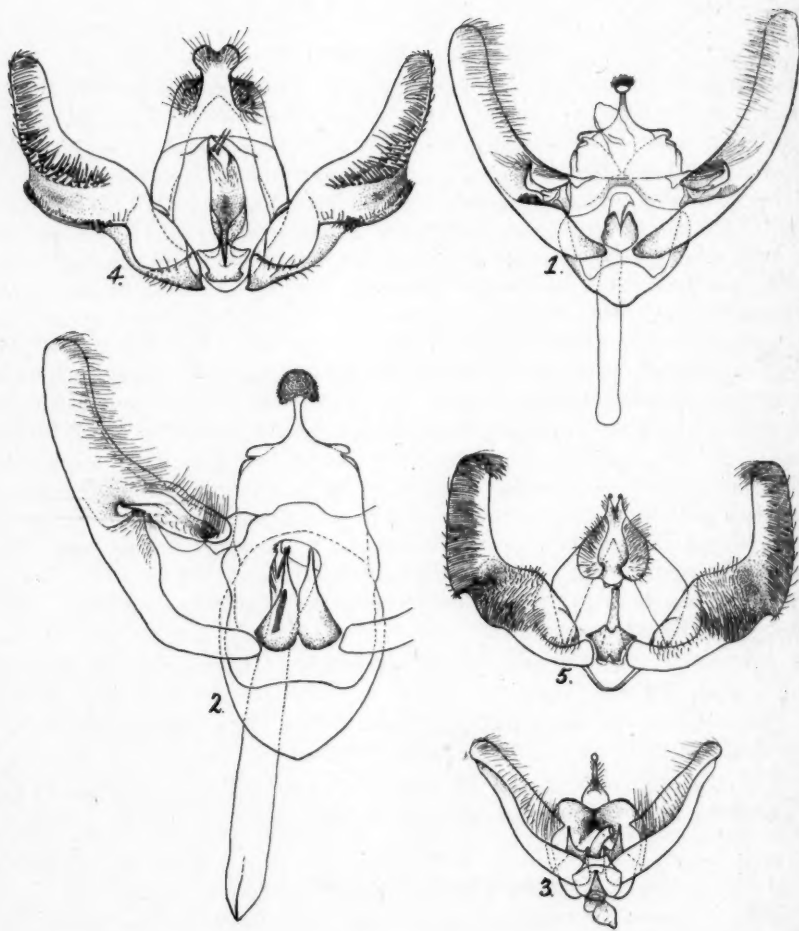


Fig. 1.—Male genitalia of *Phylctenia nordeggenensis* n. sp.
 Fig. 2.—Male genitalia of *Phylctenia sheppardi* n. sp.
 Fig. 3.—Male genitalia of *Platyptilia washburnensis* n. sp.
 Fig. 4.—Male genitalia of *Argyroploce minaki* n. sp.
 Fig. 5.—Male genitalia of *Epinotia nigrilbanoidana* n. sp.

Holotype.—♂, Aweme, Man., July 15, 1927, (N. Criddle); No. 3103 in the Canadian National Collection, Ottawa.

Dr. W. T. M. Forbes, to whom I submitted the specimen, is of the opinion that it undoubtedly belongs in his genus *Loxocrambus*, (1920, Jour. N. Y. Ent. Soc. XXVIII, 225) and is close to *mohaviellus* Forbes but lacks the postmedian line; the bulge in the outer margin (secondary apex) is also not as strongly developed in *awemensis* as in the other species.

PTEROPHORIDAE

***Platyptilia washburnensis* n. sp.**

Male.—Very similar in general appearance to *tesseradactyla* and *albicans* but smaller and darker and especially differing in the distinct, although rather short, tuft of hairs on the front, which is about as in *williamsi*. Palpi deep smoky brown, with a few white scales below, rather short, much as in *albicans*; front and thorax deep smoky brown; primaries rather deep smoky brown, especially along costa, the central portion of the wing below the cleft and both lobes being considerably sprinkled with whitish scaling; maculation rather indistinct and not clearly cut; a fine upright dark line before the base of cleft above which are slight indications of the usual dark triangular patch; beyond this on the upper lobe a rather broad diffuse whitish area, separated from a white submarginal transverse band by a darker area; the submarginal white band is continued across the lower lobe; fringes dusky in basal half, paler outwardly, with small smoky tufts at lower angle of each lobe; fringes of inner margin pale smoky with two small darker tufts, the outer of which is directly below cleft. Secondaries deep smoky with paler fringes, those of the third lobe showing usually a few scattered dark scales about the middle of the lower margin. Abdomen deep smoky with paler hairs at base; legs pale smoky, tinged with whitish scaling.

Female.—Similar to male, not markedly paler with more contrasted black markings as is found in *albicans*. Expanse 16-18 mm.

Holotype.—♂, Mt. Washburn, Yellowstone Nat. Park, Wyo., (10,000 ft.), July 25, (J. McDunnough); No. 3101 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data as Holotype.

Paratypes.—5 ♂, 3 ♀, same data as Holotype.

The male genitalia are very similar to those of *albicans* but much chunkier with shorter claspers and a shorter projection from the juxta.

BLASTOBASIDAE

***Holcocera immaculella* n. sp.**

Basal joint of antennae with strong pecten; male antennae with distinct notch beyond basal joint, cilia short, scarcely $\frac{1}{2}$; palpi, head and anterior portion of thorax smoky; posterior portion of thorax and abdomen dorsally largely clothed with silvery gray scaling, beneath which on the abdomen deep blackish scaling forms a narrow transverse band on each segment. Primaries unicolorous light ochreous, without maculation; costal edge in basal portion of wing narrowly dark smoky. Secondaries pale smoky; fringes on both wings very pale smoky. Beneath deep smoky. First two pairs of legs smoky; hind legs paler with light ochreous tuftings.

Holotype.—♂, Ottawa, Ont., June 27, 1927, (J. McDunnough); No. 3104 in the Canadian National Collection, Ottawa.

Allotype.—♀, Kazubazua, Que., June 7-10, 1927, (J. McDunnough).

Paratypes.—2 ♂, Kazubazua, Que., June 7-10, 1927, (J. McDunnough & F. P. Ide.).

In the Dietz revision (1910, Trans. Am. Ent. Soc., XXXVI, 23) the species runs to caption 14 but the entire lack of maculation precludes association with either of the species mentioned there. No other descriptions published later than this revision seem to apply to the above species so I venture to describe it as new.

EUCOSMIDAE

Endothenia heinrichi n. sp.

Endothenia montanata McD. (nec Kearfott), 1927, Can. Ent. LIX, 33.

Since my description of *Endothenia kingi* and its separation from the species I considered at the time to be *montanata* Kft. by the lack of a hair-pencil on the hind tibia in the male, I have had correspondence with Mr. Carl Heinrich, who informs me that he has again examined the male specimens of *montanata* mentioned in his revision (Bull 132, U.S.N.M. p. 101) from Ithaca, N. Y. (Coll. Cornell Univ.) and that these are without a hair-pencil; he considers *kingi* to be a synonym, or at most a duller western form, of *montanata*.

This would apparently leave the species which I had been calling *montanata*, and which shows a very distinct hair-pencil, composed of mixed black and pale ochreous hairs, on the male hind tibia, without a name. I therefore propose the above name for it.

The maculation of the primaries is similar to that of *kingi* but the light areas are paler, more whitish, and without the purplish tone found in the latter species; the basal area of the hind wings in the male is also considerably paler than the marginal band whilst in *kingi* the hind wings are uniformly smoky brown. The male genitalia of the two species are very similar but there appear to be slight differences in the shape of the socii and the sacculus and in *heinrichi* the aedeagus shows some minute apical spining which I cannot find in the corresponding portion of *kingi*.

Holotype.—♂, Pt. Pelee, Ont., May 28, (G. S. Walley); No. 3092 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data as holotype.

Paratypes.—3 ♂, 3 ♀, same locality, May 28, 29; one of these in Coll. U. S. N. M.

Argyroploce minaki n. sp.

Male.—Type of maculation of primaries is that of *glaciana* and the species is closest to *heinrichana* McD., the genitalia being closely related but differing in a number of details, as a comparison of the present figure with that of *heinrichana* (1927, Can. Ent., LIX, 33) will show. The whitish areas of primaries show a slight sprinkling of dark dots; basal area smoky brown, angled outward slightly in the cell; median band, oblique, smoky brown, with a tendency to become constricted in the cell and frequently to be suffused with paler shading above the inner margin; beyond this median band on the costa are three dark spots, the inner one almost contiguous with the band; a small dark apical spot

more or less fusing with a dark, irregular, oblique band which reaches outer margin above tornus; fringes dark, slightly checkered with white below apex and at tornus. Hind-wings smoky brown. Expanse 15-17 mm.

Female.—Similar to male.

Holotype.—♂, Minaki, Ont., July 8, (J. McDunnough); No. 3093 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

Paratypes.—7 ♂, 1 ♀, same data; 1 ♂, Victoria Beach, Man., July 9, (N. Criddle).

***Thiodia castrensis* n. sp.**

Primaries without any definite maculation, varying in color from a pale whitish to bluish gray and showing under the lens a strong sprinkling of darker scales on a very pale ground color, except along costa which is whitish. There may be present a considerable suffusion of pale salmon shading, especially noticeable in the specimen I have chosen as holotype, where this shading occupies a large basal area with oblique outer margin, forms an indistinct oblique median band, most marked on costa, and is present in apical area and along outer margin; other specimens, however, are almost without trace of this salmon-color. Occasionally the ocellar area shows some faint silvery streaks with a couple of minute black dots but this is not constant. Fringes pale smoky, the basal portion dotted with dark scaling similar to that on the wings. Secondaries pale smoky. Expanse 18 mm.

Holotype.—♂, Camp Roosevelt, Yellowstone National Park, July 25, (J. McDunnough); No. 3094 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

Paratypes.—2 ♂, same data.

The male genitalia are almost the exact counterpart of those of *scalana* Wlsh. as figured by Heinrich in his monograph (Bull. 123, U. S. N. M., Pl. 17, fig. 124) but the general appearance of the species places it closest to *salmicolorana* Heinr. This latter, however, is a smoother looking insect without the sprinkling of dark scales on the primaries and the secondaries are white, not smoky.

***Epinotia nigralbanoidea* n. sp.**

Male.—Practically identical in maculation with specimens of *nigralbana* Wlsh. from southern Alberta, such specimens possessing less extended white areas than the typical form from California. The size, however is smaller and in the male genitalia (fig. 5) there is no deep excavation at the base of the cucullus as is well shown in Heinrich's figure (Bull. 123, U. S. N. M., Pl. 52, fig. 351). Expanse 12 mm.

Holotype.—♂, Pt. Pelee, Ont., June 24, (F. P. Ide), No. 3105 in the Canadian National Collection, Ottawa.

The species apparently bears the same relation to *nigralbana* as the eastern *heucherana* Heinr. does to *ruidosana* Heinr. In this connection it might be noted that besides a paratype of *heucherana* there is a specimen in the Canadian National Collection from Saskatoon, Sask. much larger in size and with more extended white areas; as keyed by Heinrich it would run to *ruidosana* but the male genitalia are those of *heucherana* with the very characteristic uncus.

TWO NEW FORMS OF THE GENUS *ZASCHISONYX* ASHMEAD.
(TENTHREDINIDAE: HYMENOPTERA).

BY HERBERT H. ROSS,

Illinois State Natural History Survey, Urbana, Illinois.

The genus *Zaschisonyx* Ashmead includes but a single nearctic species, *Z. montana* (Cresson), of which three forms are recognized in this paper. In all these forms the males are identical, as are also the saws of the females, so that only subspecific or varietal names can be given within the group.

***Zaschisonyx montana* (Cresson).**

Selandria montana Cresson, Proc. Ent. Soc. Phila., Vol. IV, 1865, p. 244, ♀.

Selandria (Hoplocampa) gentilis Cresson, Trans. Amer. Ent. Soc., Vol. VIII, 1880, p. 14. ♂.

New synonymy.

Zaschisonyx montana Ashmead, Can. Ent., Vol. XXX, 1898, p. 257.

The typical form of the female has the vertex of the head and the dorsum of the thorax golden brown, the dorsum of the abdomen black, and the venter of the abdomen whitish. A large series of specimens shows that the form named as *gentilis* by Cresson is the male sex of *montana* Cresson. Specimens of this form have been examined from the following localities: Edmonton, Alta.; Saskatoon, Sask.; Birtle, Man.; Ottawa, Ont.; Gallatin County and Bozeman, Mont.; Pine Ridge, Neb.; Onaga and Baldwin, Kans.; Fort Collins, Colo.; and Cape, S. Dak.

***Zaschisonyx montana* var. *drabula* n. var.**

This form is structurally like *Z. montana* (Cresson). It differs in having the dorsum of the abdomen golden brown, the same color as the dorsum of the thorax. The male is similar to the male of *Z. montana* of the typical form.

Holotype: ♀, Aweme, Manitoba, Canada, May 29, 1926 (R. D. Bird). Deposited in the Canadian National Museum.

Paratypes: 12 ♀ ♀, Aweme, Man., May 28 to June 4, 1926; 2 ♀ ♀, Birtle, Man., May 9 and 13, 1927; 6 ♀ ♀, Birtle, Man., May 8 to June 2, 1928, all collected by R. D. Bird; 1 ♀, Transconia, Man., June 25, 1924, (G. S. Brooks); 1 ♀, North Dakota; and 14 ♀ ♀, Montana. Paratypes deposited in the collections of the Canadian National Museum, the U. S. National Museum, the Academy of Natural Sciences of Philadelphia, the Illinois State Natural History Survey, Dr. R. D. Bird, and the author.

This seems to be the dominant form in southwestern Manitoba, but a few specimens of the typical form have been taken with it there. It appears mixed with the typical form in Montana.

***Zaschisonyx montana* subsp. *occidentalis* n. subsp.**

This form is also structurally identical with *Z. montana* (Cresson). It differs in color as follows: vertex and dorsum of thorax black, or black mixed with blackish brown; brown of the mesopleura mottled with black above and below the white stripe; the basal portion of the ventral abdominal segments black, except for a central white line, the black decreasing apically. Male similar to the above forms.

Holotype: ♀, Juliaetta, Idaho, May 7, 1898. In the MacGillivray Collection, University of Illinois, Urbana, Illinois.

Paratypes: 1 ♀, Moscow, Idaho, May 11, 1895; 1 ♀, Juliaetta, Idaho, May 3, 1901 (J. M. Aldrich); 2 ♀ ♀, Vernon, B.C., April 30, 1925 (M. H. Ruhmann);

1 ♀, Vernon, B.C., May 8, 1907; 1 ♀, Vernon, B.C., May 18, 1917; 1 ♀, Vernon, B.C., May 29, 1908; 1 ♀, Vernon, B.C., April 3, 1926 (E. R. Buckell); 1 ♀, Okanagan Falls, B.C., April 3, 1919 (E. R. Buckell); 1 ♀, Lake County, Mont., May 22, 1927. Paratypes deposited in the collections of the University of Idaho, the Canadian National Museum, the Illinois State Natural History Survey, the Montana Agricultural Experimental Station, and the author.

This subspecies occurs west of the Rocky Mountain divide in northern Idaho and Montana, and in the southern yellow pine belt of British Columbia. Dr. A. D. MacGillivray gave this form a manuscript specific name in determinations, but I have failed to find any indication that this name was ever published.

THE CANADIAN SPECIES OF MACROPOGON (COLEOPTERA).*

BY W. J. BROWN,

Ottawa, Ont.

The National Collections include four Canadian species of *Macropogon*. They may be separated by the following table.

- | | | |
|----|---|----------------------------|
| 1. | Second, third, and fourth antennal segments moniliform, together shorter than the fifth | 2. |
| | Second antennal segment moniliform, the third and fourth longer than wide, these segments together equal in length to the fifth | 3. |
| 2. | Pronotum four-fifths as long as wide. Covey Hill, Que.; Boisetown, N. B. | <i>rufipes</i> Horn. |
| | Pronotum seven-tenths as long as wide | <i>dubius</i> n. sp. |
| 3. | Elytra black; pronotum less closely punctate and with small impunctate areas. Mt. Arrowsmith and Vancouver, B. C.; Banff, Alta.; Natashkwan, Quebec | <i>piceus</i> Lec. |
| | Elytra reddish-brown; pronotum densely punctate, without impunctate areas | <i>cribricollis</i> n. sp. |

***Macropogon dubius* n. sp.**

Length 6 mm.; width 2.1 mm. Elongate oval, moderately convex. Black, the legs in parts and antennae brown. Entire body clothed with brownish-yellow hairs.

Head rather coarsely punctate, the punctures not close except on the vertex. Antenna with the second, third, and fourth segments equal, each as wide as long, these together seven-tenths as long as the fifth which is exactly equal in length to the sixth.

Pronotum seven-tenths as long as wide, almost as wide as the elytra at base; side margins oblique, almost straight. Disk rather coarsely punctate, the punctures dense near the side margins, close elsewhere; median line narrowly in basal half and a small area on each side of median line at middle impunctate.

Elytra subparallel; striae not impressed, represented by rather coarse and close punctures; intervals not convex, finely and sparsely punctate.

Ventral side of prothorax very densely, confluent punctate. Metasternum and abdomen finely, rather closely punctate.

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

Holotype.—♂, British Columbia, No. 3076 in the Canadian National Collection, Ottawa.

This species resembles a small specimen of *piceus*. It is closely allied to *rufipes* and differs from the latter in having the pronotum much more strongly transverse at base.

***Macropogon cribricollis* n. sp.**

Length 7-7.5 mm.; width 2.7-3 mm. Elongate oval, moderately convex. Black; elytra and tarsi reddish brown; the epipleura, tarsi and antennae pale in part. Entire body clothed with yellow hairs.

Head closely, rather coarsely punctate; labrum with a few finer punctures. Antennae with second segment as wide as long; third segment almost as long as the fourth which is twice as long as wide; these three segments equal in length to the fifth which is slightly but distinctly longer than the sixth.

Pronotum three-fourths as long as wide, almost as wide as the elytra at base; side margins oblique, almost straight. Disk rather coarsely punctate; without distinct impunctate areas; the punctures very dense on the sides and near basal margin, dense but distinctly separated at middle; pubescence very conspicuous.

Elytra subparallel; striae feebly impressed but closely and rather coarsely punctate; intervals feebly convex, very finely and sparsely punctate.

Ventral side of prothorax very densely punctate. Metasternum and abdomen rather closely, not coarsely punctate.

Holotype.—Goldstream, B. C., June 20, 1924, (W. Downes): No. 3075 in the Canadian National Collection, Ottawa.

Paratypes.—1, same data as holotype; 1, Victoria, B. C., June 25, 1923, (W. Downes).

This species is very similar to *piceus* in antennal characters and differs from the latter in color and in having the pronotum much more densely punctate. The concolorous reddish-brown elytra of *cribricollis* separate it from all other species. All specimens of the type series seem to be females.

THE BIOLOGY OF CANADIAN BARK-BEETLES.*

THE SEASONAL HISTORY OF DENDROCTONUS SIMPLEX LEC.

BY L. J. SIMPSON,

Fredericton, N.B.

The larch bark-beetle, *Dendroctonus simplex* Lec., is a black beetle with reddish elytra, approximately 4.7 mm. in length, with the front convex, the pronotum constricted in front, elytra slightly wider than the pronotum, the striae moderately impressed, the stria punctures small and deep, the elytra sparsely covered with erect hairs, with the pubescence distinct. It is abundant in dying larch throughout the larch areas of Eastern Canada from the Atlantic westward across Manitoba, northern Saskatchewan and northern Alberta.

Early in the spring of 1925, at Fredericton, N.B., a healthy larch tree, about 8 inches, d.b.h., was felled and left exposed in the woods with the object

*—Contribution from the Division of Forest Insects, Entomological Branch, Dept. of Agric., Ottawa, Ont.

of obtaining infested larch material for cage studies then being commenced. On June 26, the stump of this tree was found to be infested with larch bark-beetle adults. The beetles had commenced their egg tunnels, which were then 6 inches long; numerous eggs had been laid and some had hatched.

The stump was immediately caged, including the larger roots, and a fresh piece of larch was placed in the cage in expectation that the parent adults would emerge from their first set of tunnels to cut a second set. However, this did not occur and they died in their first set of tunnels.

Observations on this stump, which contained the brood of one pair of *Dendroctonus simplex*, were made each week throughout the season and the following data were recorded:

On June 26, 1925, the attack by this species was first observed. The larvae developed rapidly, and on July 18 the egg tunnel was 9 inches long and the larvae nearly full-grown. They commenced pupating during the week of July 29 and the first new beetle was found on August 17.

The observations made were only sufficient to ascertain the condition of the larvae and the tunnels were disturbed as little as possible. After the new adults from the first brood began to appear abundantly, the egg tunnel was examined and the old adults were found dead therein, on September 16. The young adults matured, although the stump in which they were working became very dry toward the end of the season. Observations made September 8, 16, 22 and 26 and November 4, showed them to be hibernating in their original tunnels and that none had emerged. This stump was left all winter in the cage and early in the spring of 1926 a fresh piece of larch was furnished. Records were continued on this cage throughout the summer of 1926, commencing with the young beetles, that had hibernated in their original tunnels.

On May 29, these new beetles commenced to emerge from the tunnels and readily attacked the fresh piece of larch provided for them. Egg-laying was well under way by June 8; the egg tunnels were 2 inches long on June 14 and 5 inches long on June 19. Young larvae were found first on June 25. These larvae were full-grown by July 30, and pupae and young beetles were present on August 5.

Another piece of fresh larch was placed in the cage as soon as the eggs were hatched, to provide for a possible second brood. The parent beetles did not emerge, but died in their first set of tunnels after egg-laying was completed. The new brood all came through to adults and nearly all hibernated in their original tunnels; although a few of them did emerge later in the fall and cut food tunnels only in the fresh larch wood, and hibernated therein.

SEASONAL HISTORY IN 1927

First Brood

On May 20, 1927, the young adults emerged from the larch stick in which they had hibernated throughout the winter of 1926-27. When examined on May 23, the beetles had entered the bark of the fresh log, the nuptial chamber had been cut and some females had already commenced their egg tunnels. On June 1, the egg tunnels had been extended and many eggs had been laid therein. The larvae were found on June 28; they reached the pupal stage on July 25 and the young

beetles were found on August 1. These young beetles hibernated in their original tunnels.

Second Brood

On July 19, the parent beetles emerged from the stick in which they had cut their first set of tunnels and commenced a second set in the fresh wood which had been provided. After these adults were well established in their second tunnels, the stick was removed to a separate cage. On July 25, the egg tunnel had been extended and a small number of eggs laid therein. Larvae from these eggs were found on August 1, pupae on August 30, and young beetles on September 17. These young adults hibernated in their original tunnels.

Third Brood

On August 23, the parent beetles emerged from their second tunnels and commenced a third set in a fresh stick. By August 30, much of the egg tunnel had been cut and egg-laying was proceeding. Larvae from these eggs were found on September 17 and this brood hibernated as larvae in their mines during the winter of 1927-28. The original parent beetles died before winter in the third set of egg tunnels.

This bark-beetle was under observation for brood development again during the summer of 1928, our records commencing with young adults that had hibernated during the winter of 1927-28 in their original tunnels. Three cages were used.

In Cage No. 11 were placed young adults, the progeny of the May brood of 1927, designated a.1. beetles. This cage was supplied with fresh larch on May 5, and by May 21 the hibernated young adults had emerged and were entering the bark of the fresh log. Egg-laying was well advanced by May 30. Larvae were found to have hatched from these eggs on June 21 and on this date the parent adults were observed emerging from their first egg tunnels and entering the additional fresh larch logs provided for this purpose. The first brood of larvae began to pupate on July 17 and some had transformed to new beetles by July 25. This brood all came through to adults, which fed in their original tunnels and hibernated therein during the winter of 1928-29. The adults of this brood are designated A.1.1. beetles.

Second Brood, 1928.

The parent adults, the a.1 beetles, emerged from their first set of tunnels, as already noted, and began a second set on June 21. Egg-laying in the second tunnels was well advanced by June 28. Larvae from the second brood of eggs were found on July 4. These larvae developed to the stage by July 25 and some had transformed to adult beetles by August 2. This brood all came through successfully to adults and are hibernating in their original tunnels, designated the a. 1.2 beetles. The parent adults were found dead in these tunnels.

In Cage 11-A, were placed young adults from the second brood of 1927, designated the a.2 beetles. In this cage the same results were obtained as in Cage No. 11. The young adults cut two sets of tunnels, laid two broods of eggs, both broods came through to adult beetles and are hibernating in their original tunnels in each stick, designated the a.2.1 beetles and a.2.2. beetles. The parent adults died in the second set of tunnels.

In Cage No. 11-B there were the young larvae which hatched from the third brood of eggs laid by the parent adults in August, 1927. This brood hibernated as small larvae in their original tunnels during the winter of 1927-28. When fresh wood was supplied this cage in May, 1928, the stick which contained the larvae of the third brood was examined. The parent adults were found dead. The larvae developed during the early part of the season and some pupae were found on June 15. Newly-formed young adults from these pupae were found on July 4. At this time fungus developed and killed all the new beetles before they were mature enough to emerge.

As explained in the foregoing, this species has now been studied under cage conditions during the past three seasons.

In 1925, there was only one pair of adults, with abundant room for tunnels in the bark provided. Only one set of tunnels was cut. Normal conditions of temperature and humidity prevailed.

In 1926, all the beetles which developed from the single tunnel of 1925 were employed, but sufficient wood was provided so that the tunnels were not all crowded. Only a single egg tunnel was cut by each female, and it then appeared that this species was annually single-brooded at Fredericton. The season of 1926 presented normal conditions of temperature and humidity.

In 1927, all the beetles developed in the experiment of 1926 were employed and the same quantity of fresh wood was provided as in 1926, with the result that the bark was much crowded with egg-tunnels. In this season the parent beetles cut three sets of tunnels, although the season was unusually cold and wet, conditions which were expected to reduce the number of broods and probably had that influence upon other species in our cages. The factor of overcrowding may have influenced the number of broods in 1927.

In 1928, an experiment was carried out for the purpose of determining the influence of overcrowding on the number of broods. Five different cages containing this species were used. The larch wood provided in each cage was four feet long and six inches in diameter; this gave the same area of bark for the beetles in each cage. Young beetles were placed in these cages, varying in number from 2 pairs in cage 1 to 80 pairs in cage 5. These cages were placed in the same locality as had been used since our studies on this species began in 1925. The climatic conditions this season in regard to temperature and humidity were recorded as usual and were about normal. In all five cages the parent beetles cut only one set of tunnels.

In addition to these five cages, as has already been mentioned, two more cages of this species were under observation. These two cages were supplied with larch of the same size as in the other five, placed in the same locality; but all the adults which developed from the 1927 broods were employed and the bark was much more closely crowded with egg-tunnels than even in cage 5. In these two cages there were two broods this season, while in the other five there was only one. It is probable that even in cage 5 the bark was not actually overcrowded with tunnels, and that we obtained that condition only in the two extra cages, in which two broods were produced. This study is being continued.

TABLE OF BROODS

Dendroctonus simplex Lec.

1925

Parent beetles; date of origin	Tunnels	Date of attack	History of Progeny	Designation of brood
Hibernated old adults	1st tunnels	June 1925	Progeny hibernated as young adult beetles in original tunnels; emerg- ed in May, 1926	A

1926

A beetles, young adults of June 1925	1st tunnels	May 1926	Progeny hibernated as young adults in original tunnels; emerged in May, 1926. Parent beetles died in 1st set of tunnels	a
--	----------------	-------------	---	---

Dendroctonus simplex Lec.

1927

a beetles, young adults of May, 1926	1st tunnels	May	Progeny hibernated as young adults; emerged May, 1928.	a1
	2nd tunnels	July	Progeny hibernated as young adults; emerged in May, 1928.	a2
	3rd tunnels	Aug.	Progeny hibernated as larvae; emerged in July, 1928. Parent a beetles. died in third set of tunnels.	a3

***Dendroctonus simplex* Lec.**

1928

Parent beetles date of origin	Tunnels	Date of Attack	History of Progeny	Designation of brood
a.1. beetles, young adults of May, 1927.	1st Tunnels	May	Progeny hibernated as young adults; to emerge in May, 1929.	a.1.1.
	2nd Tunnels	June	Progeny hibernated as young adults; to emerge in May, 1929.	a.1.2.
a.2. beetle, young adults of July, 1927.	1st Tunnels	May	Progeny hibernated as young adults; to emerge in May, 1929.	a.2.1.
	2nd Tunnels	June	Progeny hibernated as young adults; to emerge in May, 1929.	a.2.2.
			Parent b beetles died in 2nd set of tunnels. Parent c beetles died in second set of tunnels.	
a.3. beetles, third brood, Aug., 1927.			This brood all died be- fore reaching maturity.	

OBSERVATIONS ON THE GENUS ORNITHOICA (DIPTERA: HIPPOBOSCIDAE).

BY G. F. FERRIS,

Stanford University, California.

I have in various earlier papers dealt with species of the genus *Ornithoica*. In doing so, while endeavoring to elucidate these species, I have succeeded at least in adding my full portion of errors to the existing literature. It is the intention here to call attention to these errors and to correct them as far as may be on the basis of the additional information now available.

Several species have been referred to this genus. Of these, those described by the earlier authors are at the best but dubiously recognizable on the basis of the literature alone and their status can definitely be established only by the examination of types or by circumstantial evidence such as host and locality records. *O. confluenta* Say, for example, is definitely recognizable as belonging to the genus *Ornithoica* but there is nothing in the description which will permit the separation of it from closely related forms. If it transpire, however, that but a single species of this genus appears to occur in North America we may accept that species as being *O. confluenta*. There is reason to think that such is actually the case and we may now regard the status of this species as reasonably established.

A further difficulty, constituting a trap into which the present writer has blithely ambled, is to be found in the unusually great sexual dimorphism of the species of this genus, a dimorphism that has not here-to-fore been recognized and that is greater than is known in any other genus of the family. It is dimorphism of a type that would almost certainly be overlooked on the shriveled pinned specimens employed by all earlier authors and consequently has gone unnoticed. With the present writer it was regarded not as sexual dimorphism but as involving specific differences, largely because of the curious coincidence that males and females were not available from the same host species and localities and in the same collections. As a consequence, the writer is responsible for recording male and female as distinct species. Even yet the evidence on the matter is not as clear as might be desired but the solution of the difficulty seems to be indicated.

Also it is now possible to elucidate the type species of the genus, *O. beccarina* Rondani. Dr. Gridelli, of the Museo Civico di Genova, acceding most generously to a request of Dr. J. M. Aldrich sent to the latter one of the co-type specimens of this species for examination. Dr. Aldrich most kindly, in turn, forwarded this specimen to the present writer and then at my suggestion arranged for permission to mount the shriveled, pinned specimen upon a slide in order to facilitate study. An excellent preparation was secured and is the basis for the accompanying figures. As the adequate study of these insects depends upon such preparations, although many curators would probably refuse permission to take the risks connected with their making, acknowledgments are due particularly to Dr. Gridelli.

***Ornithoica beccariina* Rondani.**

Fig. 1; Fig. 2A.

1878. *Ornithoica beccariina*, Rondani, Annali del Museo Civico di Storia Naturale di Genova 12: 160.1901. *Ornithoica beccariina* Rondani, Speiser, ibid 40 (Ser. 2a, 20): 1901.

Material examined. A single female labeled, "*Ornithoica beccariina* Rondani co-type on *Ardea alba* Amboina 12-1-72 O. Beccari" from the collection of the Museo Civico di Genova, this specimen removed from its pin mount, cleared and mounted on a slide by the present writer.

Notes. This specimen, unfortunately, was headless when received by the writer, but this is of no great importance for the head presents nothing of specific importance in this genus.

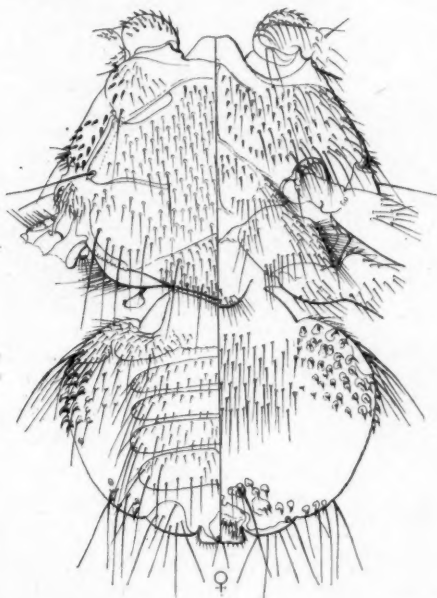


Fig. 1. *Ornithoica beccariina* Rondani, from co-type specimen; head lacking, wings and legs not shown.

The general characteristics are clearly shown in the accompanying figures and I shall call attention only to the following points. It may be noted especially that in the wing the vestiture of minute setae, which occur on both sides of the wing, extends from the vein M_3 (second cross vein) across the cell Cu_1 into the apex of the second anal cell.

The abdomen (Fig. 1) possesses four tergal plates in addition to the basal and the paired sub-apical plates. At the lateral margins, just caudad of the basal plate and extending well around onto the ventral side is an area beset with strong tubercles, each of which terminates in a small, stout, thorn-like seta. There is also a cluster of such tubercles, in part bearing more than one seta, on each side of the venter near the apex. One of these, on each side bears a cluster of slender setae.

On the lateral margin of the dorsum, just cephalad of each sub-apical plate is a conspicuous cluster of large, slender setae. The legs show no distinctive features. There is no spur at the apex of the posterior tibiae and the trochanters of the posterior legs are devoid of stout, black setae.

O. beccariina is obviously very similar to *O. confluenta* and *O. pusilla*, but on the basis of the material at hand appears to be distinct from both. It differs from both in the distribution of the setulae of the wing (compare Figs. 2A and 2E). In the other two species these setulae enter the cell Cu_1 only at its extreme apex and are not present in the second anal cell at all. It is possible that the single specimen at hand represents an extreme variant, but in a wide range of material I have no other specimen which even approaches this condition, the portion of a wing of *O. confluenta* here figured representing the maximum development found.

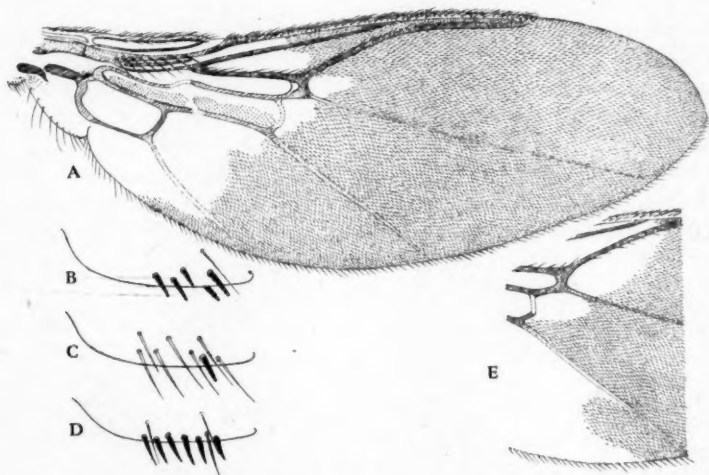


Fig. 2. *Ornithoica beccariina* Rondani; A,—wing. *Ornithoica confluenta* (Say); B,—posterior margin of posterior trochanter of male from *Junco thurberi*, California; C,—same from specimen from song sparrow, Massachusetts; E,—portion of wing showing distribution of setulae. *Ornithoica pusilla* (Schiner); D,—posterior margin of posterior trochanter of male.

Of the two species, *O. confluenta* and *O. pusilla*, the latter is the nearer to *O. beccariina* for these two agree in the common possession of a tuft of long, slender setae on the lateral margin of the abdomen just cephalad of the sub-apical plates, which is entirely lacking in the many specimens that are certainly *O. confluenta* (Figs. 4A and 4B).

It is evident that the specimen recorded by me from Borneo as *O. beccariina* is not that species. It will be discussed under *O. pusilla*.

***Ornithoica confluenta* Say.**

- 1823. *Ornithomyia confluenta* Say, Journal Academy Natural Sciences Philadelphia 3: 102.
- 1904. *Ornithoica confluenta* (Say), Speiser, Zeitschrift für Wissenschaftliche Hymenopterologie und Dipterologie 4: 86-7.
- 1922. *Ornithoica promiscua* Ferris and Cole, Parasitology 14: 203-205; tf. 19-20.
- 1923. *Ornithoica confluens* (Say), Aldrich, Insector Inscitiae Menstruus 11: 79.
- 1924. *Ornithoica promiscua* Ferris and Cole, Ferris, Entomological News 35: 235.
- 1927. *Ornithoica promiscua* Ferris and Cole, Ferris, Canadian Entomologist 59: 251.

Material examined. Twenty-one specimens, including nineteen females and but two males, from a wide range of hosts including those recorded in earlier papers and specimens from great horned owl, Wenham, Mass., and song sparrow, Rock, Mass., received through the kindness of Mr. C. W. Johnson of the Boston Museum of Natural History.

Notes. The two males now available include one from song sparrow in Massachusetts not accompanied by a female and one from *Junco thurberi*, Bluff Lake, San Bernardino Mts., Calif., accompanied by a female from the same host, this male being somewhat mutilated. It is upon the evidence of these two males that the conclusions here presented concerning the sexual dimorphism in the genus are drawn.

Specimens now being available from both eastern and western extremities of the United States, and these agreeing so closely that there can be little question concerning their specific identity, it may be assumed that but one species occurs in the United States. I am therefore prepared to relegate the species *O. promiscua* Ferris and Cole to synonymy.

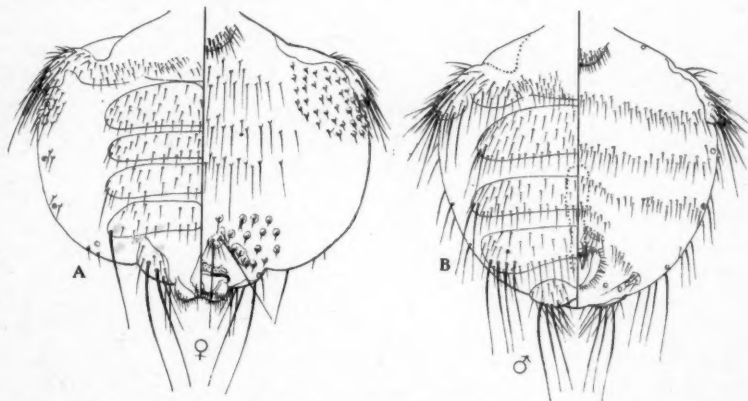


Fig. 3. *Ornithoica confluenta* (Say); A,—abdomen of female from *Junco thurberi*, California; B,—abdomen of male from song sparrow, Massachusetts.

The accompanying figures will make plain the nature and extent of the sexual dimorphism presented. It will be noted that in the abdomen of the female (Fig. 3A) there are four tergal plates in addition to the basal and apical or sub-apical plates, while in the male there are but three, and that in the female there are present areas of tubercles bearing stout setae which are entirely absent in the male. The posterior trochanters show a tendency toward the development of small, stout, black setae along the posterior border, although these are lacking almost entirely in the male from Massachusetts (Figs. 2B, 2C).

In the two males available the paired sub-apical tergal plates are united by a narrow yoke. In neither male nor female is there a tuft of slender setae on the margin cephalad of these plates (Fig. 4B).

Although I have previously recorded this species from the South Seas and from the Philippine Islands, I am now convinced that these records are in error and that they should be referred rather to *O. pusilla*.

Ornithoica pusilla (Schiner).

Figs. 2D, 4A.

1868. *Ornithomyia pusilla* Schiner, Reise Novara, p. 374.
 1901. *Ornithoica pusilla* (Schiner), Speiser, Annali del Museo Civico di Storia Naturale di Genova 40 (ser. 2a, 20): 556.
 1925. *Ornithoica promiscua* Ferris and Cole, Ferris, Philippine Journal of Science 28: 331-333; 2 tf.
 1926. *Ornithoica beccariina* Rondani, Ferris, Sarawak Museum Journal 3: 280-281; tf. 1; pl. 11, f. 1.
 1927. *Ornithoica promiscua* Ferris and Cole, Ferris, Insects of Samoa, Part 6, fasc. 1: 11.
 1927. *Ornithoica pusilla* (Schiner), Ferris, *ibid.*, p. 11; 14; 2 tf.
 1927. *Ornithoica promiscua* Ferris and Cole, Philippine Journal of Science 34: 207.
 1927. *Ornithoica pusilla* (Schiner), Ferris, *ibid.* pp. 207-209: 1. tf.

Material examined. That involved in the preparation of the papers by Ferris cited above, including specimens from *Myiagra vanicorensis*, *Demiegretta sacra* and *Aplonis atrifusca* in Samoa; *Halcyon juliae* in the New Hebrides; *Chrysocolaptes rufopunctatus*, *Ceyx samarensis*, *Ceyx melanura*, *Astur* sp., *Leucotreron leclancheri*, *Pitta atricapilla*, *Batrachostomus michrorhynchus* and undetermined host from the Philippine Islands; *Cissa jeffreyi*, Borneo.

Notes. Preoccupied with the conviction that the differences observed were of a specific order and not merely sexual and failing to appreciate the actual specific characters, I have, I am now convinced recorded a single species under three specific names. Although in no case have I the male and female from the same host species in the same locality and consequently the association of male and female is still not definitely proven, the evidence as to sexual dimorphism derived from the North American specimens of *O. confluenta* and the distributional evidence leads to a conviction of error.

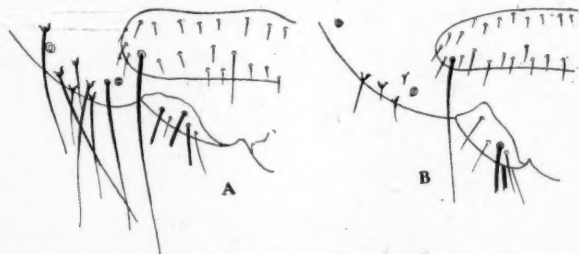


Fig. 4. Margin of abdomen of female; A,—*Ornithoica pusilla* (Schiner), from *Demiegretta sacra*, Samoa and B,—*Ornithoica confluenta* (Say) from great horned owl, Massachusetts.

In the first place it appears that the specimens from the South Seas and the Philippine Islands which I have recorded as *O. promiscua* are not that species (or *O. confluenta*), being definitely separable by the constant presence of a tuft of slender setae on each side of the abdomen just cephalad of the sub-apical dorsal plates. The presence or absence of this character is indicated in the figures that I have previously given but its significance was entirely overlooked.

In the second place it appears that the specimens recorded as *O. pusilla* (Schiner) are simply the males of the species recorded as *O. promiscua*.

In the third place it appears that the specimen recorded by me from Borneo as a female under the name of *O. beccariina* must have been a male. It is not now available, having been returned to Sarawak, but if there be any rhyme or reason to the matter it must be assumed that an error was made, al-

though such an error is inexcusable for the presence of the copulatory structures distinguishes the male readily in slide mounts.

The reference of the species to *O. pusilla* is made on the basis of the fact that this species was originally recorded from *Halcyon* in Tahiti and that the specimens at hand include some from *Halcyon* from the same general region.

The species differs from *O. beccariina*, as does *O. confluenta*, in the distribution of the setulae on the wings. Otherwise they do not appear to be separable. Should this character actually prove to be variable it would appear that *beccariina* must fall as a synonym of the earlier described *pusilla*.

***Ornithoica philippinensis* Ferris.**

1927. *Ornithoica philippinensis* Ferris, Philippine Journal of Science 34:210; 1 ff.

This species was based upon a single male from *Ceyx melanura*, in the Philippine Islands. It shows the sexual characters of but three tergal plates and of the presence of stout, black setae on the posterior trochanters, but it possesses the ventral tubercles which in the other two species here considered are characteristic of the female only.

It might be supposed that this male belongs with the female recorded from the same host and referred to *O. pusilla*, but that female agrees entirely with the other Philippine specimens of females and with those from the South Seas. There is a problem here still to be cleared up.

***Ornithoica unicolor* Speiser.**

1927. *Ornithoica unicolor* Speiser Ferris, Philippine Journal of Science 34:209; 1 ff.

I have recorded this species from a single mutilated specimen from the Philippines. It seems to be a quite distinct species and does not enter at all into the confusion indicated above.

SUMMARY.

We seem now to have something of a foundation for the further study of this genus. Four species, *O. confluenta* (Say), *O. beccariina* Rondani, *O. pusilla* (Schiner) and *O. unicolor* Speiser may be regarded as reasonably well cleared up, with *O. philippinensis* Ferris in doubt only as to the nature of its female.

There remain still the species *O. turdi* (Latreille) from Europe, *O. vicina* (Walker) from Jamaica, *O. exilis* (Walker) from New Guinea, *O. stipituri* (Schiner) from Australia and *O. podicipis* von Röder from Australia to be elucidated, *O. turdi* has been dealt with by Massonat, but his figures and description are not adequate to permit any definite decision concerning it. It would seem that specimens of this must exist in European Museums. The distributional evidence would indicate that probably *O. vicina* is actually a synonym of *confluenta*. For the others, nothing but a careful re-examination of the types will settle matters.

CORRECTION TO AN EARLIER PAPER

In this journal, volume 59, pages 248 and 249 I described as new the species *Lynchia hirsuta* and redescribed *Lynchia americana* (Leach). Two of the figures accompanying this paper are reversed as to their captions. Figure 1, labeled as *Lynchia americana*, is of *L. hirsuta* and Figure 3, labeled as *Lynchia hirsuta* is of *L. americana*. The other figures are correctly labeled.

TWO NEW SPECIES OF LISPOTHRIPS, REUTER FROM CANADA WITH NOTES ON OTHER SPECIES.

BY DUDLEY MOULTON,
San Francisco, California.

Two species of the genus *Lispthrips*, Reuter have been recognized in Europe and it is interesting now to record two new species, making the first record of this genus in North America.

The European *Aeolothrips melalucus*, Hood is clearly established now as an American species and I believe both *A. annectans*, Hood and *auricestus*, Treherne are synonyms, but a comparison of types will be necessary to confirm this opinion.

Family AEOLOTHRIPIDAE, Uzel

Aeolothrips melaleucus, Haliday.

One female specimen taken on *Viburnum sterile* at Vernon, D. C. on June 3, 1927 by Mr. H. H. Ruhman (Moulton No. 2046).

I have been able to compare this with specimens from England identified by Mr. R. S. Bagnall and from Europe identified by Dr. H. Priesner and find the species to be identical.

The species *A. annectans*, Hood and *auricestus*, Treherne are also recorded from British Columbia, Canada and both are very close if not synonyms of *melaleucus*.

Sericothrips cingulatus, Hinds.

One ♀ specimen taken "under snow" on a prairie at Birtle, Manitoba, Canada, March 22, 1928 by Mr. R. D. Bird. (Moulton No. 3027).

Lispthrips birdi n. sp.

Female, holotype. (Brachypterous). Color black including all legs except tarsi which are deep brown. Antennal segments one and two black with two brownish yellow in outer third, three yellowish at base, shading to yellowish brown in distal two-thirds, four and five deep brown, six to eight black.

Total body length (abdomen distended) 2.3 mm.; head, length .233 mm., width .216 mm.; prothorax, length .20 mm., width .33 mm.; pterothorax, width .38 mm.; abdomen, width .53 mm.; tube, length .18 mm., width at base .081 mm. Segments of antennae: length (width) I, 21 (36); II, 54 (38); III, 54 (33); IV, 54 (39); V, 54 (36); VI, 54 (33); VII, 60 (24); VIII, 42 (12); total length 383 microns. Length of spines: postoculars 40 μ , on anterior angles of prothorax 30 μ , on posterior angles, outer 51 μ , inner 45 μ , on ninth abdominal segment 70 μ , at tip of tube 105 μ . Two paratypes show the following measurements in length of antennal segments II, 51-54; III, 45-48; IV, 45-48; V, 48-48; VI, 45-51; VII, 54-57; one paratype with abdomen contracted measures 1.53 mm.

Head approximately as long as wide, cheeks very slightly arched and slightly constricted at the base, roughened. Back of head clearly sculptured. Cheeks with four or five short, sharp, spines, postoculars short with blunt tips. Eyes moderately large. Ocelli developed but small. Mouth cone short, reaching only half across prosternum, broadly rounded. Antenna 1.6 times longer than head, segments three to six broadly clavate, of about equal length, each with a short, broad pedicel, segment seven longest in the antenna, also with a pedicel, segment

eight much narrower than seven, only slightly constricted at the base and clearly separated from seven. Third antennal segment without sense cones.

Prothorax almost as long as head and one-third wider, sculpturing indistinct, prominent spines transparent with blunt tips, those at anterior angles about half as long as outer posterior pair, other spines difficult to observe because of the transparent color against the dark background. Pterothorax with slightly arched sides, sculpturing on mesonotum more or less indistinct, consisting of transverse, confluent lines, metanotum with indistinct reticulations. All legs short and stout, fore tarsi unarmed. Wings reduced to short pads.

Abdomen broadly ovate, noticeably wider than pterothorax. All spines short and transparent, longest spines on ninth abdominal segment less than half and those at tip slightly more than half as long as tube.

Type Material: Female holotype and two female paratypes taken on *Salix longifolia* on May 10, 1928, by Mr. R. D. Bird and named in his honor. Holotype and one paratype deposited in National Collection of Insects at Ottawa, Canada. Types in author's collection, (Moulton No. 3028).

Type Locality: Birtle, Manitoba, Canada.

This species is closely related to *L. crassipes*, Jablon., but may be separated by its much longer antennal segments and the weaker reticulated sculpturing on the pterothorax.

***Lispthrips populi* n. sp.**

Female, holotype. (Brachypterous). Color black, including all legs and segments of antennae except third segment which is abruptly yellow in basal half.

Total body length 1.5 mm.; head, length .21 mm., width .205 mm.; prothorax, length .18 mm.; width .33 mm.; pterothorax, width .36 mm.; abdomen, width .51 mm.; tube, length .18 mm., width at base .07 mm. Segment of antennae: length (width) I, 30 (36); II, 51 (36); III, 42 (30); IV, 46 (33); V, 48 (33); VI, 45 (30); VII, 45 (25); VIII, 33; total length 340 microns. Length of spines: postoculars 27 μ , on anterior angles of prothorax 21 μ , on posterior angles, outer 36 μ , (paratypes 30-33 μ), on ninth abdominal segment 69 μ , at tip of tube 75 microns.

This species approaches *L. birdi*, but may be separated from it as follows: seventh antennal segment 45-51 μ long, outer spines on posterior angles of prothorax 30-36 μ , third antennal segment yellowish only in basal third. In *L. birdi* the seventh antennal segment is 57-60 μ long, spines at posterior angles of prothorax 45-51 μ long and third antennal segment mostly yellow, shading gradually to brown, fourth and fifth shading gradually to dark brown.

This species is also clearly separated from *L. crassipes*, Jablon., by its longer third antennal segment and from *varicornis*, Moulton in which all of the antennal segments are much longer.

Type Material: Female holotype and two female paratypes taken on Black Poplar, February 17, 1928 by Mrs. W. W. Hippiisley. Holotype and one paratype in author's collection, one paratype deposited in National Collection of Insects at Ottawa, Canada. (Moulton No. 2691.).

Type Locality: Terrace, British Columbia, Canada.

OBITUARY

HUGH MCKELLAR.

Hugh McKellar, pioneer agriculturist, died on October 28, 1929.

Born in Oxford County, Ontario in 1849, McKellar received his education in the public schools of the district and at the Galt Collegiate Institute. Later he taught school and for six years acted as principal in the public schools of Paisley and Teeswater.

Moving West in 1880 McKellar settled on a homestead near Clearwater, Man. where he farmed for ten years. He next entered the emigration department of the provincial government and in 1892 became Chief Clerk of the Department of Agriculture, a position which he held until 1904. Proceeding in the latter year to Moose Jaw, Sask., he became secretary to the Board of Trade and in due course founder of the "Saskatchewan Farmer" and afterwards the "Agricultural Review," a paper which he edited to within a few weeks of his death.

Hugh McKellar was not strictly speaking an entomologist but as Chief Clerk of the Department of Agriculture it was his duty to keep abreast of all matters appertaining to agriculture, and when insect outbreaks occurred, to learn how to control them. Moreover there was no agricultural college staff or other source of information within the province in those days and the task of obtaining and supplying it was largely in his hands. It was under these circumstances that McKellar was brought in contact with such men as Dr. James Fletcher, Entomologist and Botanist to the Dominion Experimental Farms, and with Professor Otto Luggner, the well known entomologist from Minnesota. A perusal of Fletcher's reports from 1890 to 1904 reveals many extracts from McKellar's correspondence and indicates that he was the former's chief source of information on insect problems in Manitoba. From 1900 to 1904 he, in company with Fletcher, carried on an extensive campaign against grasshoppers. It was at this time that I first came in contact with him and he soon afterwards introduced me to Fletcher; it was also during this memorable grasshopper campaign that we first thoroughly demonstrated the superiority of poison baits over mechanical implements, such as "Hopper Dozers" and originated the "Criddle mixture." All of this was made possible through the enthusiastic co-operation of McKellar who arranged for the supplies of poison with which the experiments were carried out. Thus, in this way, as well as in others, he had a direct influence on the progress of economic entomology and for this reason, if for no other, his name is worthy of a place in its annals.

Hugh McKellar was a ready speaker and a keen enthusiast for the betterment of agriculture. His memory for the friends of pioneer days was always warm and when I visited him a few years ago he showed me, with great pride, a copy of "Farm Weeds of Canada" in which was inscribed in Fletcher's characteristic handwriting: "To my dear old friend Hugh McKellar." N. CRIDDLE.

Mailed Saturday, January 4th, 1930.

Index to Volume LXI.

- Acanthocnema ruficauda* n. sp., 133.
Acoma arizonica n. sp., 212.
Aegialia crassa insularis n. subsp., 87.
Aeolothrips melaleucus Haliday, 286.
 Agrotinae, Note on a Generic Term in the, 241.
 AINSLIE, C. N., Article by, 39.
 ALEXANDER, CHARLES P., Articles by, 15, 231, 247.
 ALLARD, H. A., Article by, 195.
Allochthonius n. gen., 154.
Allochthonius opticus Ellingsen, 155.
 " *shintostictus* n. sp., 155.
Amblycorypha oblongifolia, 198.
Ameletus cooki n. sp., 174.
 " *similior* McD., 174.
Anaxipha exigua Say, 195.
Ancistrocerus capra and the Larvae of *Epargyreus tityrus*, 265.
Anepoerus simplex Walsh, 178.
Angitia albertae n. sp., 191.
 " *basizona* Vier., 192.
 " *cacoeciae* Vier., 192.
 " *fenestralis* Holmg., 193.
 " *incipiens* n. sp., 192.
 " *macer* Cress., 192.
 " *rosanae* Vier., 192.
 " *triops* n. sp., 191.
Anisota manitobensis, Notes on the Early Stages of, 98.
Anthidium collectum Huard, Notes on the Habits of, 84.
 Anthomyids Belonging to the Genus *Hylemyia* Rob.-Desv., New Canadian, 93, 110, 136, 161, 180.
Anuraphis gutierrezis n. sp., 200.
Apechthis ornatulus n. sp., 190.
 Aphids from Utah, A Few Match Brush, 199.
Aphis cryptus n. sp., 199.
 " *maidiradicis* Forbes, 199.
Aphodius anomaliceps n. sp., 207.
 " *bryanti* n. sp., 88.
 " *carri* n. sp., 89.
 " *corruptor* n. sp., 206.
 " *cruciatatus* Lec., 210.
 " *dentigerulus* n. sp., 208.
 " *dialytoides* Fall, 211.
 " *edmontonus* n. sp., 87.
 " *hamatus garmani* n. subsp., 227.
 " *hamatus* Say, 225.
 " *humeralis* Lec., 211.
 " *hyperboreus* Lec., 229.
 " *occidentalis* Horn, 225.
 " of the Subgenus *Diapterna*, Revision of the Species of, 224.
 " *omissus* *omissus* Lec., 227.
 " *torpidus* Horn, 228.
 " *pingellus* n. sp., 228.
 " *pinguis* Hald., 230.
 " *pyriformis* n. sp., 205.
 " *sagittarius* Harold, 225.
 " *snowi* n. sp., 209.
 " *validus* Horn, 230.
Apochthonius J. C. Chamberlin, 152.
 " (*Apochthonius*) *intermedius* n. sp., 153.
Apochthonius (*Apochthonius*) *moestus* (Banks), 153.
 " (*Heterochthonius*) *crobyli* n. sp., 153.
Aradus compressus Heidemann, 246.
 " *gracilis* n. sp., 245.
 " , New Species and New Records of, 243.
 " *nigrinus canadensis* n. subsp., 246.
 " *paganicus* n. sp., 244.
 " *quadrilineatus* Say, 243.
Arctocorixa bilineata Provancher, 34.
 " , Notes on the Identity of the Provancher Species of, 34.
Arctocorixa trilineata Provancher, 36.
Argynnis montivaga oweni Edw., 107.
 " *nevadensis gallatini* n. var., 106.
Argyroplote minaki n. sp., 270.
 BALDUF, W. V., Articles by, 125, 221.
 Barkbeetles, The Biology of Canadian, 145, 274.
 Bembidion, A New, 135.
 " (*Peryphus*) *mackinacensis* n. sp., 135.
 BISHOP, SHERMAN C., Article by, 101.
Blapstinus cinerascens n. sp., 58.
Bolbocerosoma matatum n. sp., 213.
 Bombomima and Laphria with Descriptions of Three New Species and Two New Varieties, Notes on the Asilid Genera, 157.
Bombomima fernaldi Back, 160.
 " *huron* n. sp., 159.
 " *posticata brunnea* n. var., 159.
 " *scutellaris* n. var., 159.
 " *vorax* n. sp., 158.
 BOOK NOTICES:
 Contribution Toward a Monograph of the Adelginae (Phylloxeridae) of North America by P. N. Anand, 96.
 Destructive and Useful Insects, Their Habits and Control by C. L. Metcalf and W. P. Flint, 23.
 Elementary Lessons on Insects by James G. Needham, 24.
 A Handbook of the Dragonflies of North America by Jas. G. Needham and Hortense B. Heywood, 120.
 Manual of External Parasites by H. E. Ewing, 264.
 Principles of Forest Entomology by Samuel Alexander Graham, 241.
 The Problems of Applied Entomology by R. A. Wardle, 168.
 BOOK REVIEW:
 The Principles of Systematic Entomology by Gordon F. Ferris, 47.
 BRAUN, ANNETTE F., Article by, 38.
Brenthis helena *ingens* B. & McD., 106.
 " *kriemhild* Stkr., 106.
 BRIAND, L. J., Article by, 51.
 BRODIE, H. J., Article by, 98.
 BROMLEY, S. W., Article by, 157.

BROWN, W. J., Articles by, 86, 108, 204, 224, 273.

BUCKLE, J. W., Article by, 265.

Callanthidium illustre Cresson, On the Nesting Habits of, 1.

Callipterine from Victoria, B. C., A New, 237.

Campoplegidea Parasitic on Ellopia fiscellaria Gn., A New, 22.

Campoplegidea (Viereckiana) ellopiae n. sp., 22.

Camptocladus byssinus, 224.

Capitophorus elongatus n. sp., 11.

" gregarius n. sp., 13.

" oestlundii Knowlton, 11.

" utense n. sp., 201.

CARR, F. S., Article by, 134.

Centropitulum bifurcatum McD., 171.

" conturbatum n. sp., 171.

" zvalshi n. sp., 173.

CHAMBERLIN, JOSEPH CONRAD, Article by, 152.

CHAMBERLIN, RALPH V., Article by, 37.

Chilopods, Two New Lithobioid, 37.

Chthonius californicus J. C. Chamberlin, 154.

Chthonius tetrachelatus Preysler, 154.

Cicadella hieroglyphica var. dolobrata Ball, Concerning, 69.

Cinygma tarda n. sp., 178.

Coleoptera from Western Canada, II, New, 251.

Coleoptera, Notes on a Few Minnesota, 256.

Coleoptera, Some New Species of, 108.

Coleoptera, XIII, New, 54.

Compsaditho iatana n. sp., 152.

Coneheaded Katydid, 195.

Conotrachelus retusus n. sp., 59.

Cordilura alberta n. sp., 132.

" criddlei n. sp., 131.

" fasciventris fulvithorax n. var., 131.

" inversa n. sp., 131.

" ontario n. sp., 132.

" passiva n. sp., 130.

" varicornis n. sp., 130.

Cordylurella costalis n. sp., 133.

Corn root-anthris, 199.

CRAMPTON, G. C., Article by, 70.

Crane-Flies of Quebec, A List of the, 231, 247.

Crane-Flies Part XIII, New Nearctic, 15.

Crane-Fly, Protoplasia fitchii, Observed near Chandler in the Gaspé Peninsula, A Swarm of Males of the Rare and Primitive, 70.

Criddleia n. gen., 31.

" hemiptera n. sp., 32.

CROSBY, C. R., Article by, 101.

Cryptomyzus ribis Linnaeus, 10.

CURRAN, C. H., Articles by, 30, 45, 130.

CUSTER, CLARENCE P., Article by, 49.

Cylindrocopturus, A New, 134.

" medicatus n. sp., 134.

Dendroctonus piceaperda Hopk., 145.

" simplex Lec., 274.

Dermanyssus gallinae L. in the Nest of a House Wren, Note on the Occurrence of the Mite, 39.

Dermestis lardarius L., 238.

Dialytellus n. gen., 212.

" dialytoides Fall, 212.

" humeralis Lec., 212.

Dialytes criddlei n. sp., 210.

Diapterna, Revision of the Species of Aphodius of the Subgenus, 224.

Dicranomyia gibsoni n. sp., 17.

Dicranota notabilis n. sp., 18.

Didactylia d'Orb., 90.

" knausii Fall, 91.

" parca Horn, 91.

Diptera, Some New Nearctic, 30.

Ellopia fiscellaria Gn., A New Campoplegidea Parasitic on, 22.

Endothenia heinrichi n. sp., 270.

Epargyreus tityrus, Ancistrocerus capra and the Larvae of, 265.

Epeorus albertae McD., 177.

Ephemerella deficiens Morg., 170.

" flavilinea McD., 169.

" hecuba Eaton; Description of

Various Stages, 260.

Ephemerella heterocaudata n. sp., 170.

" tibialis McD., 170.

Ephemeroptera with Descriptions of New Species, II, Notes on North American, 169.

Epinotia nigralbanoidea n. sp., 271.

Erebia sofia Stkr., 106.

Eremocoris canadensis n. sp., 41.

" melanotus n. sp., 42.

" with Notes and a Key to the Species of Peritrechus, Two New Species of, 41.

Erioptera (Erioptera) gaspeana n. sp., 250.

" viridula n. sp., 20.

" painteri n. sp., 19.

Euphydryas, A New California, 44.

" irelandi n. sp., 44.

Eupithecia albipunctata Haw., 61.

" ammonata n. sp., 63.

" annulata Hbst., 68.

" bryanti Tayl., 61.

" castigata Hbn., 61.

" coagulata Gn., 63.

" columbiata Dvar., 62.

" edna Hulst., 63.

" fletcherata Tayl., 62.

" gelidata Moesch., 66.

" georgii n. sp., 67.

" hanhami Tayl., 67.

" harlequinaria Dyar, 62.

" harveyata Tayl., 61.

" helveticaria Bdv., 64.

" indistincta Tayl., 65.

" innotata Hufn., 66.

" kasloata Dyar, 65.

" luteata Pack., 62.

" nimbicolor Hbst., 65.

" perfusca Hbst., 67.

" pygmaea Hbn., 61.

- Eupithecia satyrata* Hbn., 64.
 " *silenata* Stndfs., 60.
 " *sobrinata* Hbn., 68.
Eupithecias, Synonymic Notes on Canadian, 59.
Eupithecia terminata Tayl., 64.
 European Corn Borer (*Pyrausta nubilalis* Hubn.) with Special Reference to Equipment and Cages, Laboratory Breeding of the, 51.
Eutheresia Towns., 33.
 " *interrupta* n. sp., 33.
 " *trivittata* n. sp., 33.
- FALL, H. C., Article by, 54.
 FERRIS, G. F., Article by, 280.
 Field Cricket, 195.
 FLETCHER, FRANK C., Article by, 256.
 Four-Spotted Tree Cricket, 196.

Genitalia Attached to Specimens, Mounted, 97.

- GLENDENNING, R., Article by, 237.
 Gracillaridae, A New Genus and Species in the, 38.
Gryllus assimilis pennsylvanicus Burm., 195.
 GUNDER, J. D., Articles by, 44, 97.

HATCH, MELVILLE H., Articles by, 76, 135.

- Heptagenia cruentata* Walsh, 180.
 " *persimplex* n. sp., 179.
Heterochthonius n. subgen., 153.
 Heterosphyronida, On Some False Scorpions of the Suborder, 152.
 HICKS, CHARLES H., Articles by, 1, 84, 121.
Hilaira balia n. sp., 103.
Hister jaquesi n. sp., 76.
 Histeridae, Studies on, 76.
Holcocera immaculella n. sp., 269.
Homaemus aeneifrons Say, 254.
 " " *extensus* n. subsp., 256.

- " *bijugis* Uhl., 254.
 " *parvulus* Germ., 254.
 " *proteus* Stal., 254.
 " *variegatus* Van D., 254.
 " with a Key to the Species, Notes on, 253.

- HOPPING, GEO. R., Article by, 251.
 HOPPING, RALPH, Article by, 251.
 HUCKETT, H. C., Articles by, 93, 110, 136, 161, 180.

- Hydrochus currani* n. sp., 108.
Hylemyia abitibiensis n. sp., 167.
 " *aquitima* n. sp., 138.
 " *brevipalpis* n. sp., 180.
 " *brunetta* n. sp., 139.
 " *canadensis* n. sp., 162.
 " *consobrina* n. sp., 187.
 " *crucifera* n. sp., 93.
 " *egleformis* n. sp., 142.
 " *equifrons* n. sp., 163.
 " *frontulenta* n. sp., 161.
 " *garretti* n. sp., 117.
 " *gemina* n. sp., 95.

- Hylemyia impersonata* n. sp., 114.
 " *lobata* n. sp., 137.
 " *mutans* n. sp., 113.
 " *neomexicana* Mall., 115.
 " *nigricaudata* n. sp., 116.
 " *oppidans* n. sp., 165.
 " *pedicillaris* n. sp., 181.
 " *pentaformis* n. sp., 110.
 " *pilicauda* n. sp., 141.
 " *planipalpis* Stein, 94.
 " *propinqua* n. sp., 118.
 " *repleta* n. sp., 112.
 " *replicata* n. sp., 136.
 " Rob.-Desv., New Canadian Anthomyids Belonging to the Genus, 93, 110, 136, 161.
 " *scamansi* n. sp., 143.
 " *sedula* n. sp., 183.
 " *setisissima* n. sp., 164.
 Hymenoptera, Descriptions of New Canadian Parasitic, 190.

- Ips borealis* Sw., 145.
 " *perturbatus* Eichh., 145.
 Iron deceptiva McD., 177.

JOHANNSEN, O. A., Article by, 223.

- KNIGHT, HARRY H., Article by, 214.
 KNOWLTON, GEORGE F., Articles by, 9, 199.

Labopella n. gen., 215.

- " *claripennis* n. sp., 215.
Labops verae n. sp., 214.
Laphria acutus Walker, 160.
 " *milvina* n. sp., 160.
 " with Descriptions of Three New Species and Two New Varieties, Notes on the Asilid Genera *Bombomima* and, 157.

Larch bark-beetle, 274.

Larder Beetle Infestations Arising from Tent Caterpillars, 238.

- LAWSON, PAUL B., Article by, 69.
 Lepidoptera from Yellowstone Park and the Adjacent Regions of Montana, Notes on Some Diurnal, 105.

Leptophlebia adoptiva n. sp., 169.

- Lisothrips birdi* n. sp., 286.
 " *populi* n. sp., 287.
 " , Reuter from Canada with Notes on Other Species, Two New Species of, 286.

Loxocrampus avemensis n. sp., 267.

Macropogon cribricollis n. sp., 274.

- Macropogon dubius* n. sp., 273.
 " *piceus* Lec., 273.
 " *rufipes* Horn, 273.
 " , The Canadian Species of, 273.
 Match Brush Aphids from Utah, A Few, 199.

- McDUNNOUGH, J., Articles by, 59, 105, 169, 241, 266.
 Meadow Katydid, 198.
Methia brevis n. sp., 58
 Microlepidoptera, Some Apparently New, 266.
Microneta discepra n. sp., 101.
 " *gargopa* n. sp., 101.
 Miridae, Labops verae, New Species, with Labopella, Nicholia, and Pronotocrepis, New Genera of North American, 214.
 Mite, Dermanyssus gallinae L. in the Nest of a House Wren, Note on the Occurrence of the, 39.
Monocrepidius delicatus n. sp., 55.
 " *difformis* n. sp., 56.
 " *ferruginosus* n. sp., 54.
 " (*Heteroderes*) *planidiscus* n. sp., 56.
 MOULTON, DUDLEY, Article by, 286.
Mundochthonius japonicus n. sp., 152.
 Myzini (Aphididae) from Utah with Descriptions of Two New Species, Notes on a Few Species of, 9.
Myzocallis pulchellus n. sp., 237.
 Myzus aquilegiae Essig, 10.
 " cerasi Fabricius, 9.
 " houghtonensis Troop, 10.
 " persicae Sulzer, 9.

 Nemobius palustris Blatchley, 196.
 Neoconocephalus triops Linn., 195.
 Neomyzus circumflexus Buckton, 10.
 Neuroterus (Cynipidae) on Bur Oak, Tetrastichus verrucarii, New Species, A Chalcid Parasite of, 221.
 Neuroterus niger Gillette, 222.
 Neuroterus verrucarum O. S., 222.
 Nicholia n. gen., 215.
 " eriogoni n. sp., 216.
 Nipponobius n. gen., 37.
 " migrans n. sp., 37.
 Notes on North American Ephemeroptera with Descriptions of New Species, II, 169.

 OBITUARY :
 Ernest Henry Blackmore, 218.
 Harrison Gray Dyar, 46.
 Hugh McKellar, 288.

 Oblong-winged Katydid, 198.
Odontaelus alabamensis n. sp., 239.
 " Dej., A New Species of, 239.
Oecanthus nigricornis quadripunctatus, 196.
Oeneis jutta reducta n. var., 105.
Onthophagus blatchleyi n. sp., 86.
 " medorensis n. sp., 204.
 Orchelimum agile, 198.
Orchestes uniformis n. sp., 110.
Ormosia cramptoniana n. sp., 249.
 " *gaspensis* n. sp., 249.
 " *huronis* n. sp., 20.
 " *ingloria* n. sp., 21.

Ornithoica beccarina Rondani, 281.
 " *confluenta* Say, 282.
 " , Observations on the Genus, 280.
 " philippinensis Ferris, 285.
 " pusilla Schiner, 284.
 " unicolor Speiser, 285.
 Orthoptera, Physiological Differentiation in Overwintering Individuals of Certain Musical, 195.

 PACK, H. J., Article by, 199.
 PARSHLEY, H. M., Article by, 243.
 Perdita zebrata with Description of Larva, Habits of, 49.
 Peritrechus Fieber, 43.
 " fraternus Uhler, 44.
 " paludemaris Barber, 43.
 " saskatchewanensis Barber, 44.
 " tristis Van Duzee, 44.
 " , Two New Species of Eremocoris with Notes and a Key to the Species of, 41.
 Perophylla camellifolia, 198.
Philaenus canadensis n. sp., 156.
 " in America North of Mexico, Notes on the Genus, 155.
Philaenus leucophthalmus Linn., 156.
 " var. fabricii Van D., 156.
Philaenus leucophthalmus var. fasciatus (Fabr.), 156.
Philaenus leucophthalmus var. lateralis (Linn.), 156.
Philaenus leucophthalmus var. leucocephalus Linn., 156.
Philaenus leucophthalmus var. marginellus Fabr., 156.
Philaenus leucophthalmus var. pallidus Zett., 156.
Philaenus leucophthalmus var. ustulatus Fabr., 156.
Philaenus lineatus Linn., 156.
 " parallelus Stearns, 156.
Phlyctenia nordeggenis n. sp., 266.
 " sheppardi n. sp., 267.
 Phorodon humuli Schrank, 11.
Plateros columbiensis n. sp., 108.
Platyptilia washburnensis n. sp., 269.
Podabrus falli n. sp., 252.
 " fissilis Fall, 252.
 Polistes annularis, 219.
 " pallipes, 25, 219.
 " rubiginosis, 220.
 " variatus, 220.
 " Wasps, Feeding Experiments on, 25.
 Polygraphus rufipennis Kby., 145.
 " " , The Seasonal History of, 146.
Polymera (Polymera) rogersiana n. sp., 18.
Polymena pratensis n. sp., 193.
Pronotocrepis n. gen., 217.
Pronotocrepis clavicornis n. sp., 217.
 Protoplasma fitchii Observed near Chandler in the Gaspe Peninsula, A Swarm of Males of the Rare and Primitive Crane-fly, 70.

- Protolithocolletis* n. gen., 38.
 " *lathyri* n. sp., 38.
Pseudochthonius Balzan, 154.
 " *simoni* Balzan, 154.
Pseudomasaris edwardsii Cresson, Another
 Pollen-Provisioning Wasp, with
 Further Notes on *P. vespoidea*
 Cresson, 121.
Pseudomasaris vespoidea Cresson, 121.
 Psota, F. J., Article by, 119.
Ptenidium californicus n. sp., 119.
 " from California, A New, 119.
Pinus ocellus n. sp., 109.
Pyrausta nubilalis Hubn., with Special Re-
 ference to Equipment and Cages,
 Laboratory Breeding of the Euro-
 pean Corn Borer, 51.
- RAU, PHIL., Articles by, 25, 219.
 RAY, E., Article by, 119.
Rhaphium ciliatum n. sp., 30.
Rhithrogena robusta Dodds, 180.
Rhyssalus neglectus n. sp., 92.
 " *puncticollis* n. sp., 91.
 ROSS, HERBERT H., Article by, 272.
- Saprinus assimilis* ab. *semisulcus* nov., 79.
 " (*Hypocaccus*) *eriensis* n. sp., 82.
 " " *jaquesi* n. sp., 83.
 " " *michiganensis* n.
 sp., 83.
Saprinus (*Hypocaccus*) *ohioensis* n. sp., 82.
 " " *ontarioensis* n. sp.,
 82.
Saprinus (*Hypocaccus*) *propensoides* n. sp.,
 83.
Saprinus lugens ab. *distinguendoides* nov.,
 78.
Saprinus lugens ab. *oregonensis* nov., 78.
Saprinus lugens ab. *sejunctoides* nov., 78.
Saprinus oregonensis ab. *distinguendus*
 Mars., 79.
Saprinus oregonensis ab. *leconteoides* nov.,
 79.
Saprinus oregonensis ab. *pseudodistinguen-*
us nov., 79.
Saprinus oregonensis ab. *pseudosejunctoides*
 nov., 79.
Saprinus oregonensis ab. *pseudosejunctus*
 nov., 79.
Saprinus oregonensis ab. *sejunctus* Mars.,
 79.
Saprinus pennsylvanicus ab. *profusoides*
 nov., 79.
Saprinus pennsylvanicus ab. *profusus* Csy.,
 79.
 Scarabaeidae, Studies in the, 86, 204.
 Scatophagidae, New Species of, 130.
Sciara caesar n. sp., 223.
 " from Canada, A New Species of,
 223.
 " *pauciseta*, 224.
 " *prolifera*, 224.
 Scorpions of the Suborder Heterosphy-
 ronida, On Some False, 152.

- Sericothrips cingulatus* Hinds, 286.
 SHEPHERD, DAVID, Article by, 260.
 SIMPSON, L. J., Articles by, 146, 274.
Siphonurus barbaroides n. sp., 174.
 " *berenice* McD., 175.
 " *rapidus* McD., 175.
 Spiders, Three New Species of, 101.
 STRICKLAND, E. H., Article by, 238.
 SWAINE, J. M., Article by, 145.
 Syrphid from Canada, A New, 45.
Syrphus venablesi n. sp., 45.
- Tent Caterpillars, Larder Beetle Infestations
 Arising from, 238.
Tetrastichus verrucarii n. sp., 221.
 " " , New Species,
 A Chalcid Parasite of *Neuroterus*
 (Cynipidae) on Bur Oak, 221.
Tetrastichus verrucarii with Notes on its
 Hosts on Bur Oak, the Bionomics of,
 125.
Thiodia castrensis n. sp., 271.
Tidabius aberrans n. sp., 37.
 Tiny Cricket, 195.
Tipula aldrichiana n. sp., 16.
 " *gaspensis* n. sp., 233.
Trichofeltia, 241.
Trichogramma minutum Riley, Large Scale
 Production of the Egg Parasite, 73.
Tritogenaphis escalantii Knowlton, 203.
 " *gutierrezia* n. sp., 203.
 " *utahensis* n. sp., 202.
 True Katydid, 198.
- Vespa arborea*, 220.
 " *crabro*, 220.
 " *germanica*, 220.
 " *maculata*, 219.
 " *norvegica*, 220.
 " *rufa*, 220.
 " *sylvestris*, 220.
 " *vulgaris*, 220.
 WALLEY, G. STUART, Articles by, 22, 34, 41,
 155, 190, 253.
 WALLIS, J. B., Article by, 239.
 Wasps, Feeding Experiments on *Polistes*, 25.
 " , The Silk Spun by the Larvae of
 Certain Social, 219.
 WISHART, GEO., Article by, 73.
- Xarifa lobata* n. sp., 57.
- Zaschisonyx* Ashmead, Two New Forms of
 the Genus, 272.
Zaschisonyx montana (Cresson), 272.
 " *drabula* n. var., 272.
 " " *occidentalis* n. subsp.,
 272.